

## Notes on *Hydnochaete* (*Hymenochaetales*) with a seta-less new species discovered in China

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**Abstract** — *Hydnochaete asetosa* is described here as a new species from tropical China. It is distinguished from all other species by the absence of hymenial setae and the presence of clavate cystidia and oblong ellipsoid basidiospores. An annotated identification key is provided for the ten species thus far accepted in *Hydnochaete*.

**Key words** — *Hymenochaetaceae*, taxonomy, wood-inhabiting fungi

### Introduction

The genus *Hydnochaete* was established by Bresadola (1896), revised systematically by Ryvarden (1982), and later studied by various authors (Parmasto 1995, Valenzuela et al. 1996, Parmasto 2005, Dai & Niemelä 2006, Yuan et al. 2006). The genus is well characterized by dark, reddish or yellowish brown basidiocarps, hydroid hymenophore, presence of hymenial setae, a monomitic to dimitic hyphal structure with simple septa on generative hyphae, and hyaline, thin-walled basidiospores. Most members of the genus occur in warm temperate, subtropical, and tropical forests (Ryvarden 1982, pers. obs.). The recent discovery of one *Hydnochaete* species with a few hymenial setae from Taiwan (Parmasto & Wu 2005) suggests that setae are probably pleomorphic in the genus.

As a result of nuclear rDNA sequence analysis of a limited sampling around *Hymenochaete* Lév. species that support *Hydnochaete duportii*, *H. japonica*, *Cyclomyces* Kunze ex Fr., and *Stipitochaete* Ryvarden clustering with *Hymenochaete* species, Wagner & Fischer (2002) transferred the two *Hydnochaete* species to *Hymenochaete*. These recombinations have been challenged, however, by a more recent rDNA phylogeny by Larsson et al. (2006). This analysis, which included a much larger taxon sampling in the

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hymenochaetoid clade, placed *Hymenochaete duportii*, *Hydnochaete japonica*, and *Hydnochaete olivacea* in different, well-supported clades. A robust phylogeny of *Hymenochaete*, *Hydnochaete*, *Cyclomyces*, *Stipitochaete*, *Pseudochaete*, and related fungi is still required for a reclassification of these fungi; nomenclaturally speaking, however, the oldest generic name, *Cyclomyces*, has priority if they are shown to be monophyletic at the genus level. Until then, we keep *Hydnochaete* as a morphological genus for practical purposes.

Among collections from a recent survey of wood-inhabiting fungi in tropical forests of Hainan, southern China, two specimens showed typical *Hydnochaete* characters such as golden yellowish brown basidiocarps, hydroid hymenophore, and a dimitic hyphal system with simple septate generative hyphae but no hymenial setae were found. The absence of setae combined with other morphological differences when compared to other *Hydnochaete* species lead us to propose a new species for these collections.

### Materials and methods

The studied specimens were deposited in herbaria as cited below. Sections were studied at magnification up to x1000 by using a Nikon Eclipse E80i microscope and phase contrast illumination following guidelines set forth by Cui et al. (2009). Drawings were made with the aid of a drawing tube. Microscopic features, measurements, and drawings were made from slide preparations stained with Cotton Blue and Melzer's reagent. Spores were measured from sections cut from the tubes; in presenting spore size data, the 5% of the measurements excluded from each end of the range are shown in parentheses. Abbreviations include IKI (Melzer's reagent, with IKI- = inamyloid), KOH (5% potassium hydroxide), and CB (Cotton Blue; CB+ = cyanophilous; CB- = acyanophilous). Additional abbreviations include L (mean spore length; arithmetic average of all spores), W (mean spore width; arithmetic average of all spores), Q (variation in the L/W ratios between the specimens studied), and n (number of spores measured from given number of specimens). Special color terms follow Petersen (1996).

### Description

*Hydnochaete asetosa* Y.C. Dai, sp. nov.

FIG. 1

MYCOBANK MB 516032

*Carpophorum* annum, effuso-reflexum vel pileatum, hydnaceum; dentes usque ad 2 mm longi, 3–4 per mm. Systema hypharum monomiticum, hyphae generatoriae septatae, efibulatae; spores oblonge-ellipsoideae, hyalinae, IKI-, CB-, 5–6 × 2.8–3.3 µm.

TYPE. — China. Hainan Prov., Changjiang County, Bawangling Nature Reserve, Dongsi, alt 1200 m, on dead tree of *Cyclobalanopsis* (Fagaceae), 8.V.2009 Dai 10756 (holotype in BJFC, isotype in IFP).

ETYMOLOGY — *asetosa* (Lat.) refers to the absence of setae.

FRUITBODY — Annual, pileate to effused-reflexed, often imbricate, coriaceous and without odour or taste when fresh, becoming brittle or rigid when dry. Pilei conchate, usually confluent, imbricate, projecting up to 2 cm, 5 cm wide and 2.5 mm thick at base; margin sharp. Upper surface of pilei dark brown to black when fresh, tomentose to hirsute with narrow concentric zones. Hymenophore hydroid, buff to pale yellow when fresh, becoming cinnamon-buff to honey-yellow up on drying; aculei clavate to subulate, terete or flattened, mostly solitary, rarely confluent, occasionally furcate, 3–4 per mm and up to 2 mm long. Context rust brown, hard corky, up to 0.5 mm thick, distinctly duplex, lower part dense, separated from upper part by one black line, upper part more or less tomentum.

HYPHAL STRUCTURE — Hyphal system monomitic; generative hyphae without clamp connections; tissue darkening but unchanged in KOH.

CONTEXT — Generative hyphae hyaline to golden yellow, thin- to distinctly thick-walled with a wide lumen, rarely branched, regularly arranged, 2–5  $\mu\text{m}$  in diam. Hyphae in the dark line strongly agglutinate, dark brown, strongly interwoven. Hyphae in upper layer context (tomentum) golden yellow, distinctly thick-walled with a wide lumen, frequently simple septate, straight, unbranched, 2.5–4  $\mu\text{m}$  in diam.

ACULEI — Tramal hyphae hyaline to yellowish brown, thin- to thick-walled, occasionally branched, flexuous, interwoven, some bearing yellowish crystals, 2–4.5  $\mu\text{m}$  in diam. Setae absent. Cystidia abundant, basically clavate, sometimes fusiform, hyaline, thin- to slightly thick-walled, usually with an apical yellowish crystal, 40–57  $\times$  5–6  $\mu\text{m}$ ; fusiform cystidioles occasionally present. Basidia clavate, with four sterigmata and a simple septum at the base, 13–19  $\times$  4–5  $\mu\text{m}$ ; basidioles in shape similar to basidia, but slightly smaller. Hyphae at dissepiment edge sometime encrusted with yellowish crystals, cystidia alike.

SPORES — Basidiospores oblong ellipsoid, hyaline, thin-walled, smooth, IKI–, CB–, (4.7–)5–6(–6.7)  $\times$  (2.7–)2.8–3.3(–3.7)  $\mu\text{m}$ , L = 5.53  $\mu\text{m}$ , W = 3.07  $\mu\text{m}$ , Q = 1.77–1.84  $\mu\text{m}$  (n = 60/2).

ADDITIONAL SPECIMEN (PARATYPE) EXAMINED — China. Hainan Prov., Changjiang County, Bawangling Nature Reserve, alt. 1200 m, on fallen trunk of *Cyclobalanopsis*, 8.V.2009 Cui 6382 (paratype in BJFC).

REMARKS — *Hydnochaete asetosa* is characterized by oblong ellipsoid basidiospores, clavate cystidia, and the absence of hymenial setae. Its basidiospores are the widest of all among *Hydnochaete* species, thus readily distinguishing it from other species in the genus that lack setae and possess clavate cystidia. The identification key to the ten accepted taxa below is based on specimen studies and literature data.

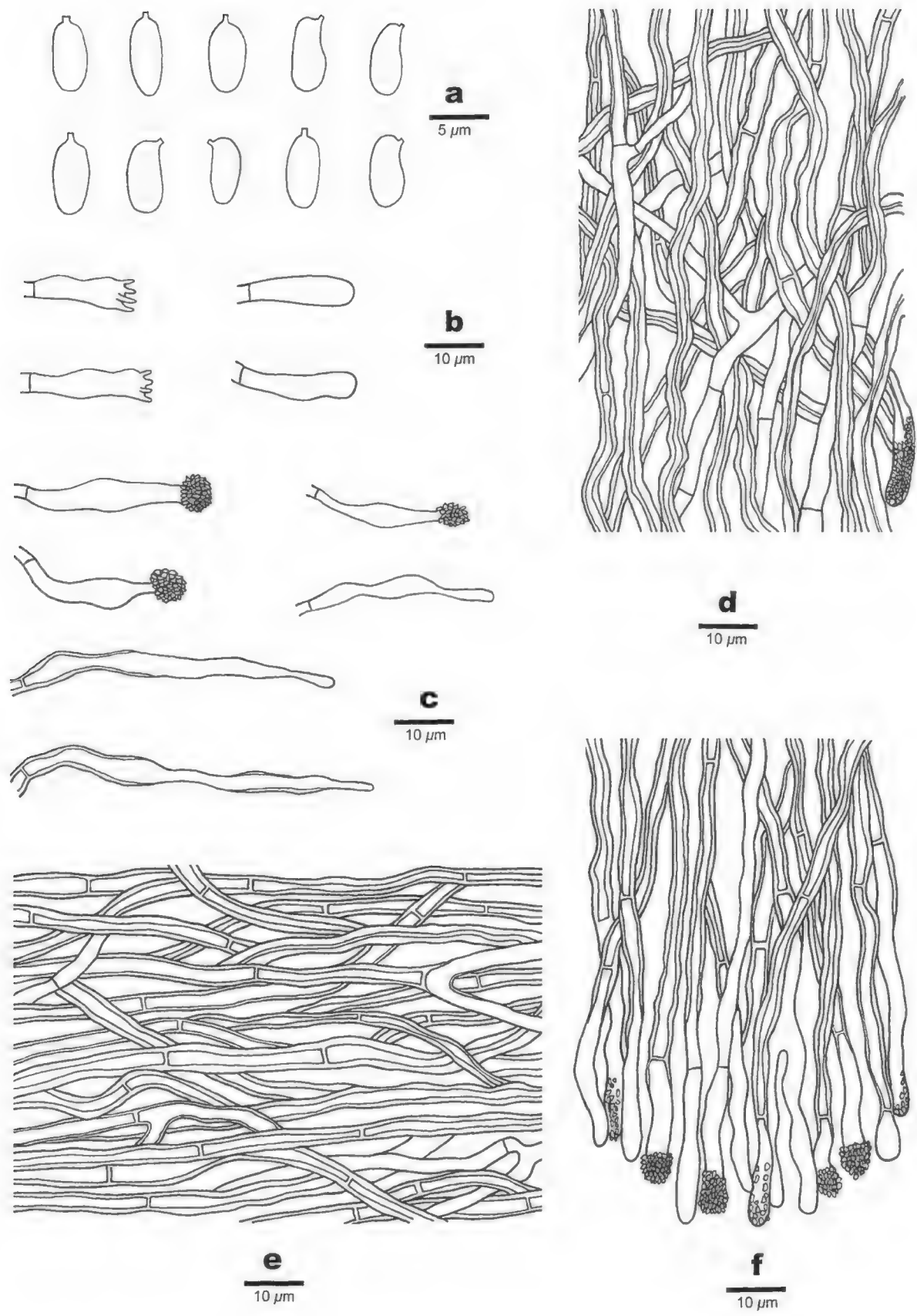


FIG. 1. Microscopic structures of *Hydnochaete asetosa* (drawn from the holotype).  
—a: Basidiospores. —b: Basidia and basidioles. —c: Cystidia. —d: Hyphae from aculei.  
—e: Hyphae from context. —f: Hyphae from dissepiment edge.

# Key to accepted species of *Hydnochaete*

1. Setae absent or extremely rare ..... 2
1. Setae present and abundant ..... 3
2. Cystidia abundant  
(spores oblong ellipsoid,  $5-6 \times 2.8-3.3 \mu\text{m}$ ; setae always absent) ..... *H. asetosa*
- 2 Cystidia absent  
(Parmasto & Wu 2005: spores narrowly cylindric,  $4.2-5.5 \times 1.4-1.8 \mu\text{m}$ ;  
setae occasionally present but rare,  $25-40 \times 4-6 \mu\text{m}$ )  
..... *H. paucisetigera* Parmasto & Sheng H. Wu
3. Spores  $< 1.5 \mu\text{m}$  in width ..... 4
3. Spores  $> 1.5 \mu\text{m}$  in width ..... 5
4. Context homogeneous; setae  $> 8 \mu\text{m}$  in width  
(Valenzuela et al. 1996: setae  $50-150 \times 8-16 \mu\text{m}$ ; spores  $4-5.6 \times 1-1.5 \mu\text{m}$ )  
..... *H. olivacea* (Schwein.) Banker
4. Context duplex; setae  $< 8 \mu\text{m}$  in width  
(Dai 5124: setae  $32-65 \times 5-6 \mu\text{m}$ ; spores  $4.6-5.2 \times 1.2-1.4 \mu\text{m}$ )  
..... *H. tabacina* (Berk. & M.A. Curtis ex Fr.) Ryvarden
5. Hyphal system monomitic, dichrohyphae present  
(Valenzuela et al. 1996: setae  $64-96 \times 6.4-10.2 \mu\text{m}$ ; spores  $3.2-4.8 \times 1.6-2 \mu\text{m}$ )  
..... *H. resupinata* (Sw.) Ryvarden
5. Hyphal system dimitic, dichrohyphae absent .....6
6. Hymenophore hydroid to semi-lamellate; setae apically encrusted  
(Dai & Niemelä 2006: setae  $50-110 \times 7-20 \mu\text{m}$ ; spores  $4.5-5.5 \times 1.5-1.9 \mu\text{m}$ )  
.....*H. tabacinoides* (Yasuda) Imazeki
6. Hymenophore hydroid or papillate; apices of setae smooth .....7
7. Hymenophore papillate to hydroid, spines 3–5/mm  
(Ryvarden 1982: setae  $35-70 \times 7-15 \mu\text{m}$ ; spores:  $3-4 \times 1.5-2 \mu\text{m}$ )  
.....*H. peroxydata* (Berk. ex Cooke) Dennis
7. Hymenophore hydroid, spines 1–3/mm .....8
8. Basidiocarps pileate, context distinctly duplex, spines 1–2 mm long  
(Ryvarden 1982: setae  $35-150 \times 6-9 \mu\text{m}$ ; spores:  $4-5 \times 1.5-2 \mu\text{m}$ )  
.....*H. saepiaria* (Lloyd) Ryvarden
8. Basidiocarps resupinate, context homogeneous, spines  $\leq 0.8$  mm long .....9
9. Black line present next to substrate, aculei sharp  
(Dai & Niemelä 2006: setae  $40-120 \times 7-14 \mu\text{m}$ ; spores:  $4.5-5 \times 1.5-2 \mu\text{m}$ )  
.....*H. duportii* Pat.
9. Black line absent, aculei blunt  
(HMAS 35618: setae  $30-68 \times 5.8-8 \mu\text{m}$ ; spores:  $3.9-4.5 \times 1.6-2 \mu\text{m}$ ) . . . .*H. japonica* Lloyd

OTHER SPECIMENS EXAMINED. — *Hydnochaete duportii*. China. Guangxi Auto. Reg., Donglan County, on fallen angiosperm trunk, 20.I.1958 Xu 811 (HMAS 35617).  
— *H. japonica*. China. Guangxi Auto. Reg., on fallen angiosperm trunk, 14.IX.1958

Liang 1626 (HMAS 35618). Fujian Prov., on dead angiosperm tree, 17.XI.1955 Yu (HMAS 34810). — *H. olivacea*. Canada, Quebec Prov., Gatineau Park, Pinks Lake., on *Quercus*, 11.VII.1979 Binyamini 672 (H). USA. West Virginia, on dead limbs of *Quercus*, 30.VII.1938 Bonar (HMAS 49250). — *H. paucisetigera*. China. Taiwan, Nanton, Huisun Forest Station, on fallen angiosperm branch, 12.VII.1997 Wu 971212 (TNM F10074, type). — *H. tabacina*. China. Beijing, Tanzhesi, on fallen trunk of *Quercus*, 25.IX.2003 Dai 5124 (IFP). — *H. tabacinoides*. China. Hunan Prov., Liuyang County, Daweishan Nature Reserve, on fallen trunk of *Camellia*, 21.XII.2000 Dai 3267 (IFP).

As mentioned by Ryvarden (1982), *Hydnochaete japonica* and *H. duportii* are very similar, and their differences are mostly in macromorphology. Ito (1955) stated that spores of *H. japonica* are hyaline and thin-walled, globose, 3.5  $\mu\text{m}$  in diam. Of the three specimens of *H. japonica* from China studied, the few spores found from specimen HMAS 34810 were cylindric, hyaline, thin-walled, smooth,  $3.9\text{--}4.5 \times 1.6\text{--}2 \mu\text{m}$ . According to our study, *H. japonica* and *H. duportii* basidiospores are very similar, but *H. duportii* has longer, sharp spines while those in *H. japonica* are shorter and blunt. Wagner & Fischer (2002) cited similar nLSU rDNA sequences for *H. japonica* and *H. duportii*, but the subsequent phylogenetic analysis of *Hymenochaetales* by Larsson et al. (2006) supports slight differences between *Hydnochaete japonica* and *H. duportii*. We keep the two species independent for the time being, and more fresh materials are needed to confirm the situation.

We retain *Hydnochaete* as a morphological genus although the Larsson et al. (2006) phylogenetic placement of *H. olivacea* into a clade separate from *H. japonica* and *H. duportii* suggests that the genus as currently delimited is polyphyletic. Subdivision of *Hydnochaete* is anticipated once a phylogeny is generated that includes all ten *Hydnochaete* species.

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